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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/669,889	09/25/2003	Takatoshi Tsujimura	028567-0118	2240
2292	7590	11/02/2005	EXAMINER	
BIRCH STEWART KOLASCH & BIRCH PO BOX 747 FALLS CHURCH, VA 22040-0747			ROY, SIKHA	
			ART UNIT	PAPER NUMBER
			2879	

DATE MAILED: 11/02/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/669,889

Applicant(s)

TSUJIMURA ET AL.

Examiner

Sikha Roy

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 22 August 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) 14-18 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 September 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 1/12/04.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

**DETAILED ACTION**

***Election/Restrictions***

Applicant's election without traverse of Group I, claims 1-13 in the reply filed on August 22, 2005 is acknowledged.

Claims 14-18 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected Group II, there being no allowable generic or linking claim.

***Priority***

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

***Drawings***

Figure 9 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Specification***

The disclosure is objected to because of the following informalities:

Page 2 line 8 'resistant' should be replaced by -- resistance--.

Page 14 line 5 'indium thin oxide' should be replaced by --indium tin oxide--.

Page 26 line 11 'carbon film 29a' should be replaced by -- carbon film 28a --,  
because 29a is the cathode layer in Fig. 7.

Appropriate corrections are required.

The title of the invention is not descriptive. A new title is required that is clearly  
indicative of the invention to which the claims are directed.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that  
form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public  
use or on sale in this country, more than one year prior to the date of application for patent in the United  
States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by  
another filed in the United States before the invention by the applicant for patent or (2) a patent  
granted on an application for patent by another filed in the United States before the invention by the  
applicant for patent, except that an international application filed under the treaty defined in section  
351(a) shall have the effects for purposes of this subsection of an application filed in the United States  
only if the international application designated the United States and was published under Article 21(2)  
of such treaty in the English language.

Claims 1 and 2 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S.  
Patent 6,351,067 to Lee et al.

Regarding claim 1 Lee discloses (Fig. 1 column 2 lines 29-40, column 3 lines 10-  
28) an organic light emitting device comprising an emitting layer 108 made of an organic

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luminescent medium generating light by charge injection (hole-electron recombination in which a migrating electron drops from its conduction potential to a valence band in filling a hole, energy is released as light) an electrode (anode) 102 supplying charges (injected holes) to the emitting layer and a buffer layer 106 made of diamond-like carbon between the emitting layer and the electrode.

Regarding claim 2 Lee discloses (Fig. 1 column 3 lines 10-28) the electrode 102 is an anode supplying holes to the emitting layer and the organic EL device further comprises a cathode electrode 104 supplying electrons to light emitting layer and a buffer layer of diamond-like carbon positioned between the cathode electrode and the light emitting layer.

Claims 1 and 3 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,833,667 to Hamano et al.

Regarding claim 1 Hamano discloses (Fig. 1 column 7 lines 49-51, column 8 lines 18-25, 54-67, column 13 lines 54-60) an organic electroluminescent device comprising an emitting layer 4 made of organic material generating light by charge injection an electrode 2 supplying charges to the emitting layer 4 and a diamond-like carbon (amorphous carbon) film between the emitting layer and the electrode. The examiner notes here that amorphous carbon is also known as DLC or diamond-like carbon.

Regarding claim 3 Hamano discloses (column 7 lines 49-60) the electrode includes a material selected from aluminum and copper.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 4-6 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over 6,727,645 to Tsujimura et al., and further in view of U.S. Patent 6,486,559 to Ueno.

Regarding claim 4 Tsujimura discloses (Fig. 2, 3E column 4 lines 42-63, column 5 lines 8-25) an organic light-emitting display device comprising a substrate 26, an emission control circuit with TFT 12 and 14 formed on the substrate 26, an insulating film 32 covering the control circuit and organic light-emitting device including a first electrode 34, a second electrode 36 formed on the insulating layer 32, a contact wiring structure for electrically connecting the emission control circuit and the organic light-emitting device. Tsujimura further teaches (Fig. 3E) the conductive wiring includes a first conductive layer (connection element) 61 for providing a good electrical connection between the driver TFT on the lower layer and cathode of OLED on the upper layer, composed of a conducting film same as of the first electrode, a second conductive layer made of the same material as the second electrode by extending the second electrode (Fig.2).

Claim 4 differs from Tsujimura in that Tsujimura does not exemplify a diamond-like carbon film between the first and second conductive layers in the contact wiring structure.

In the same field of endeavor Ueno discloses (Fig.6 column 3 lines 25-36 column 4 lines 28-61) a copper wiring structure 39a in a semiconductor device is buried in a groove 35a having inner wall 37a in organic interlayer film 35 deposited to form electroconductive diamond-like carbon or amorphous carbon film. Ueno further discloses this electroconductive carbon layer 37a serves as a barrier layer and completely prevents the wiring from being oxidized by moisture existing in the interlayer and thus provides a wiring structure with high reliability with reduced resistance.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to include the electro-conductive diamond-like carbon (amorphous carbon) film under the second conductive layer and hence between the first and second conductive layers, in the contact wiring connecting the OLED to the control circuit for preventing oxidization of the conductive layer from any moisture existing in the wiring structure and thus providing a highly reliable contact wiring.

Regarding claim 5 Tsujimura discloses (column 4 lines 51-54) the first electrode (anode) 34 includes aluminum.

Regarding claim 6 Ueno discloses (column 4 lines 55-61) the diamond-like carbon (amorphous carbon) film contains fluorine.

Regarding claim 13 Tsujimura discloses (column 4 lines 3-24 Figs. 1,2) the emission control circuit of the organic LED device includes a driver TFT 12 for

controlling current to the OLED device and a switching TFT 14 connected to the data line 22 and scan line 24 for controlling the driver TFT 12 and the contact wiring structure is electrically connected to the driver device by conducting line 30.

Claims 7, 8, 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over 6,727,645 to Tsujimura et al., and U.S. Patent 6,486,559 to Ueno and further in view of U.S. Patent 6,833,667 to Hamano et al.

Referring to claim 7 Tsujimura discloses the organic light emitting device includes a light emitting layer 16 made of organic material generating light by charge injection from anode 34 and cathode 36. Tsujimura fails to disclose a diamond-like carbon film between the emitting layer and the first electrode.

Hamano in analogous art of organic electroluminescent device discloses (column 8 lines 18-43) a diamond-like (amorphous) carbon film formed between the first electrode (anode) and the light-emitting layer. Hamano further discloses that this amorphous carbon film exhibits high work function and it is better to use the amorphous carbon film in order to efficiently inject holes into the luminous layer and thus to increase the efficiency of the device.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to include the diamond-like (amorphous) carbon film between the first electrode and the light emitting layer of the light emitting device of Tsujimura and Ueno as taught by Hamano for efficiently injecting holes into the luminous layer and thus increasing the efficiency of the device.



Regarding claim 8 Hamano does not disclose the diamond-like carbon film between the first electrode and the light emitting layer containing fluorine.

However Ueno discloses (column 1 lines 53-62, column 2 lines 50-53, column 3 lines 25-31) the diamond-like carbon film (amorphous carbon) supplemented or added with fluorine having relative dielectric constant of 3 or less is conductive. It is noted that a conductive layer on the first electrode improves charge conduction from the electrode to the adjacent luminescent layer above.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to substitute the diamond-like carbon film containing fluorine as taught by Ueno for the diamond-like (amorphous) carbon film of Hamano for increasing conductivity and hence the efficiency of the device.

Regarding claims 11 and 12 Hamano discloses (column 10 lines 14-17) the second electrode (cathode) includes aluminum same as the first electrode material (column 7 line 58) and hence the work function of the material of the second electrode is same as that of the material of the first electrode.

Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over 6,727,645 to Tsujimura et al., U.S. Patent 6,486,559 to Ueno, U.S. Patent 6,833,667 to Hamano et al. and further in view of U.S. Patent 6,351,067 to Lee et al.

Regarding claim 9 Tsujimura, Ueno and Hamano disclose the first electrode is an anode supplying holes to the emitting layer and the second electrode is a cathode supplying electrons to the light emitting layer. But Tsujimura, Ueno and Hamano are

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silent about a diamond-like carbon layer between the emitting layer and the second electrode.

Lee in analogous art of organic EL device discloses a buffer layer of diamond-like carbon between the second electrode and the light emitting layer. Lee further teaches this configuration increases the electroluminescent efficiency of the device.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to include a diamond-like carbon layer between the emitting layer and the second electrode of Tsujimura, Ueno and Hamano as suggested by Lee for increasing the electroluminescent efficiency of the device.

Regarding claim 10 Lee does not exemplify the diamond-like carbon film between the second electrode and light emitting layer containing fluorine.

However Ueno discloses (column 2 lines 50-53, column 3 lines 25-31) the diamond-like carbon film (amorphous carbon) supplemented or added with fluorine having relative dielectric constant of 3 or less serves as barrier layer preventing any invasion of moisture.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to substitute the diamond-like carbon film of Lee with diamond-like carbon film containing fluorine as taught by Ueno for preventing invasion of moisture into the organic light-emitting layer and thus enhancing the life of the device.

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### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Patent 6,372,628 to Matsubara et al. and EP 0794569 to Endo et al. disclose fluorine containing amorphous carbon film used in the wiring of a semiconductor device. JP 11031587 to Futaba Denshi Kogyo discloses DLC film used between the anode and hole transportation layer for providing high brightness of an organic electroluminescent display.

### ***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sikha Roy whose telephone number is (571) 272-2463. The examiner can normally be reached on Monday-Friday 8:00 a.m. – 4:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimeshkumar D. Patel can be reached on (571) 272-2457. The fax phone number for the organization is (703) 308-7382.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

*Sikha Roy*

Sikha Roy  
Patent Examiner  
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